Bitesize Research: Venous Disease

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This bite size research article will highlight four different venous disease studies that have occurred in the past 50 years. Since the advent of medical ultrasound in the 1950s, studies have explored how ultrasound can be used to identify and characterise venous disease. To start with there is a summary and a link to the first feasibility study that describes using augmentation of flow to identify venous reflux and venous occlusion1. This is followed by a study that systematically reviewed and consolidated the accuracy of using B-mode and colour Doppler ultrasound to identify DVT2 and a population-based study that highlights the clinical impact of patients diagnosed with DVT and the severity of the underlying disease3. To finish, there is a summary of one of the more recent randomised clinical trials to treat patients with lower limb ulcers, which highlights the importance of an early intervention in those with superficial venous reflux4.

With risk factors for chronic venous disease growing (particularly age and BMI), so will its prevalence5. The John Lind venous top ten priorities has highlighted that the main issues of concern for the future includes the provision of specialised assessment and treatment for all patients (https://www.jla.nihr.ac.uk/priority-setting-partnerships/vascular-conditions/venous-top-10-priorities.htm). It also describes other key areas for future research to focus on, including identifying why venous disease progresses in some cohorts and not others; how to prevent DVT, varicose veins, symptoms and tissue damage; and most notably how can better awareness and education be improved. To tackle the future burden of venous disease, vascular scientists will need to take a seat at the head of this table.

References

1. Sigel, B. A BRIEF HISTORY OF DOPPLER ULTRASOUND IN THE DIAGNOSIS OF PERIPHERAL VASCULAR DISEASE. (1998).
2. Goodacre, S., Sampson, F., Thomas, S., van Beek, E. & Sutton, A. Systematic review and meta-analysis of the diagnostic accuracy of ultrasonography for deep vein thrombosis. BMC Med Imaging 5, 6 (2005).
3. Søgaard, K. K., Schmidt, M., Pedersen, L., Horváth–Puhó, E. & Sørensen, H. T. 30-Year Mortality After Venous Thromboembolism. Circulation 130, 829–836 (2014).
4. Gohel, M. S. et al. A Randomized Trial of Early Endovenous Ablation in Venous Ulceration. New England Journal of Medicine 378, 2105–2114 (2018).
5. Davies, A. H. The Seriousness of Chronic Venous Disease: A Review of Real-World Evidence. Adv Ther 36, (2019).

Sigel et al. ***Augmentation Flow Sounds in the Ultrasonic Detection of Venous Abnormalities - A Preliminary Report*** *Investigative Radiology 2(4):p 256-258, July 1967.*

SUMMARY

A feasibility study that first reported the use of augmenting the flow of venous blood to assess the competency of deep venous system in the lower limbs. In the supine position, CFV, PoPV and PT veins were assessed for spontaneous flow ("S" sound resembling a windstorm), continuously or intermittently in phase with respiration. Whereas compression of the thigh, calf or foot lasting few seconds created "A" sounds that was distinct, loud and brief. Abnormal "S" sounds were described as either high pitch and continuous not modulated with respiration, diminished sounds compared to contralateral side, or no sound. Four types of "A" sounds were categorised, and their significance proposed, including vein occlusion or incompetent veins depending if "A" sounds were absent or present in relation to compression site being distal or proximal to probe location.

PROS

Also compared the results to some venographic findings and showed how a functional assessment could help identify abnormalities.

CONS

Only 17 out of 65 patients had venograms. Limited description on the definition of "A" sound with its duration etc.

IMPACT AND OTHER SIMILAR STUDIES

Identified a simple but effective way of testing the functional capacity of veins.

Yao J, Gourmos C, Hobbs J: Detection of proximal vein thrombosis by Doppler ultrasound flow. Lancet 1972, 1:1-4.

Goodacre et al. ***Systematic review and meta-analysis of the diagnostic accuracy of ultrasonography for deep vein thrombosis.*** *BMC Med Imaging. 2005 Oct 3:5:6.*

SUMMARY

Main aim was to estimate the sensitivity and specificity of using ultrasound for DVT by summarising the numerous studies that had been conducted over the years. A meta-analysis showed that the sensitivity for detecting proximal DVT (in the thigh) was 94-97% depending if Duplex or Triplex methods were used. The analysis also showed that whilst compression ultrasound showed greatest specificity to rule out DVT, colour-doppler had the optimal sensitivity to detect a DVT.

PROS

Reviewed studies from 1966 to 2004, with a large number of studies and cohorts (100 in total!) included in the final meta-analysis (10,323 patients in total).

CONS

Heterogeneity of the studies including, patient characteristics, training and different levels of experience of operators, use of different time points in assessment made reviewing the effects of study design on the results difficult and a 'weakness in the meta-analysis'. The benefit of repeat US assessment could not be determined.

IMPACT AND OTHER STUDIES

Consolidated the use of ultrasound as a diagnostic tool for DVT.

Kraaijpoel et al. (2020) Diagnostic accuracy of three ultrasonography strategies for deep vein thrombosis of the lower extremity: A systematic review and meta-analysis. PLoS ONE 15(2): e0228788.

Søgaard et al. 30-Year Mortality After Venous Thromboembolism. Circulation. 2014 Sep 2;130(10):829–36.

SUMMARY

A nationwide population-based study where patients with venous thromboembolism (VTE) were compared to a large population-based cohort. Without treatment for DVT and PE there is a significant risk of death: in the first 30 days, it can be as high as 3% for DVT and 31% for PE; over a 30-year period mortality rate ratio was 1.55 for DVT and 2.77 for PE.

PROS

Size of database and level of completeness (follow-up/patient records etc). Low selection bias due to nature of the study, adjusted for risk factors (cancer, trauma, surgery, pregnancy before VTE) and covariates such as sex and age.

CONS

Cause of death was dependent on subjective judgement, can only be generalised to Danish/Western societies.

IMPACT AND OTHER STUDIES

Highlights long term mortality following VTE and severity of the disease.

Robertson et al. Incidence and risk factors for venous reflux in the general population: Edinburgh Vein Study. Eur J Vasc Endovasc Surg.2014;48(2):208–14

EVRA Trial Investigators. A Randomized Trial of Early Endovenous Ablation in Venous Ulceration. N Engl J Med. 2018 May 31;378(22):2105-2114

SUMMARY

A RCT where patients with venous leg ulcers were either randomised to compression therapy and undergo early endovenous ablation of superficial venous reflux within 2 weeks or to receive compression therapy alone, with consideration of endovenous ablation deferred until after the ulcer was healed or until 6 months after if ulcer was unhealed. Ulcers healed faster with early endovenous ablation of superficial venous reflux.

PROS

Multicentre RCT study with 450 patients that investigated the urgency and timing of the intervention.

CONS

Patients had ulcers less than six months old and patients were compliant with compression therapy, which didn't emulate real world situation.

IMPACT AND OTHER TRIALS

Supports early treatment of varicose veins/superficial venous reflux for patients with venous leg ulcer.

Compression therapy (ESCHAR) - BMJ. 2007 Jul 14;335(7610):83.

Treatments for varicose veins - N Engl J Med. 2014 Sep 25;371(13):1218-27.